Reinforcement of Cu Nanoink Film with Extended Carbon Nanofibers for Large Deformation of Printed Electronics

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Metallic nanoparticle inks (nanoinks) have attracted great interest in the manufacturing of printed flexible electronics. However, micro-cracks and pores generated during the sintering process deteriorate mechanical and electrical characteristics of the sintered nanoink film. To alleviate these problems, we demonstrated the use of very long carbon nanofiber (CNF, average length 200 μm) to reinforce the sintered nanoink films. In this study, different weight fractions of CNFs are dispersed into the Cu nanoink to improve the mechanical bending characteristics. Scanning electron micrographs (SEM) shows improved dispersion of oxidized CNF in the nanoink compared to the as-received CNF. The composite nanoinks are stencil printed on polyethylene terephthalate (PET) film and sintered by intense pulsed light system using Xe-flash. The electrical measurements show 90 %, 65 %, and 66 % improved electrical conductivity in the composite nanoink film (0.7 % of oxidized CNF) compared to the pure Cu nanoink under the 75 mm, 50 mm, and 25 mm of bending radii, respectively.

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